LOW-COST NEAR-EARTH ASTEROID SAMPLE RETURN MISSION CONCEPTS*

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ABSTRACT

Collecting a sample from the surface of a near-Earth asteroid (NEA) is compelling for two reasons, First, the science return would greatly increase our knowledge of asteroids and shed light on the formation of the solar system, Such a sample would allow scientists to correlate asteroid spectra with meteoritic samples or identify a new type of solar system body. Data on regolith structure, age, and composition would also be obtained. Evidence would also be available to study space weathering. All of this information would be gathered within the context of a specific location on a known body. The second reason for conducting an NEA sample return mission is that it likely would be the simplest and least expensive mission for the next surface sample return. Lessons learned from such a mission could not only be applied to other small body sample return missions, but to missions to collect samples from other bodies as well.

In this paper, several concepts are examined for NEA sample return missions. To be addressed are various mission concepts, spacecraft system concepts, sample acquisition techniques, science payload, schedule, and lifecycle costs. Mission and spacecraft concepts based on electric propulsion are described as well those with the more traditional chemical propulsion. Options for more than one level of technology are addressed. Launch vehicle options will include the Pegasus, Taurus, Delta , and Proton. A summary of sample return mission opportunities to NEA targets are provided for key sets of assumptions,

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